Editor's note: 93 I.D. 95; Appealed -- aff'd, sub nom Clark Oil Producing v. Hodel, 667 F.Supp. 281 (ED. La. 1987)

SUN OIL CO. ET AL.

IBLA 81-883 Decided February 28, 1986

Appeals from a decision by Administrative Law Judge John R. Rampton, Jr., sustaining the allocation formula prepared by Geological Survey to allocate production of unitized substances and fixing interest. OCS-G 2087 and OCS-G 2088.

Affirmed as modified.

1. Oil and Gas Leases: Unit and Cooperative Agreements--Outer Continental Shelf Lands Act: Oil and Gas Leases--Outer Continental Shelf Lands Act: Unit Plans

   Where an appellant criticizes a division of a reservoir delineated by Geological Survey on the Outer Continental Shelf on the grounds that various errors resulted in inaccurate allocation of original gas-in-place, and the evidence fails to establish that any substantial error occurred, the reservoir division will be affirmed.

2. Oil and Gas Leases: Unit and Cooperative Agreements--Outer Continental Shelf Lands Act: Oil and Gas Leases--Outer Continental Shelf Lands Act: Unit Plans

   The law of capture, which provides that the owner of a tract acquires title to the oil and gas which he produces from wells drilled thereon, even though part of such oil or gas migrated from adjoining lands, is fully applicable on the Outer Continental Shelf in the absence of a unitization agreement. Where, however,

unitization has been ordered, allocation of production to competing tracts should normally be made on the basis of net-acre feet.

3. Oil and Gas Leases: Drainage--Oil and Gas Leases: Unit and Cooperative Agreements--Outer Continental Shelf Lands Act: Oil and Gas Leases--Outer Continental Shelf Lands Act: Unit Plans

   Where Geological Survey decides to deviate from straight net-acre feet allocation of production from a common reserve, a 6-month period prior to formation of a unit agreement (during which all wells in a competitive reservoir were producing and during which the parties were negotiating the terms of the unit agreement) will not be found to be an unrepresentative period for purposes of calculating the production factor in an allocation formula.

4. Accounts: Payments--Oil and Gas Leases: Unit and Cooperative Agreements--Outer Continental Shelf Lands Act: Oil and Gas Leases--Outer Continental Shelf Lands Act: State Laws--Outer Continental Shelf Lands Act: Unit Plans--Payments: Generally

   Under sec. 4 of the Outer Continental Shelf Lands Act, 43 U.S.C. § 1333(a)(2)(A) (1982), the civil and criminal laws of each adjacent state, now in effect or hereafter adopted, amended, or repealed, are declared to be the law of the United States for that portion of the subsoil and seabed of the Outer Continental Shelf which would be within the area of the state if its boundaries were extended seaward to the outer margin of the Outer Continental Shelf to the extent that such laws are applicable and not inconsistent with 43 U.S.C. §§ 1331-1356 (1982) or with other Federal laws and regulations of the Secretary now in effect or hereafter adopted. Application of Louisiana law, calling for 7 percent simple interest, the legal rate at the time the unit agreement was made, was proper to compensate a lessee for the time value of money held by a unit participant who produced unitized substances in excess of its allocated share.

APPEARANCES: Theodore L. Garrett, Esq., and William P. Skinner, Esq., Washington, D.C., for Petro-Lewis Corporation; Joseph C. Bell, Esq., and Mary Anne Sullivan, Esq., Washington, D.C., for Shell Offshore, Inc., Robert

Shaw, Esq., and John T. McMahon, Esq., New Orleans, Louisiana, for Shell Offshore Inc., Dana Contratto Esq., Philip A. Fleming Esq., Thomas R. Lundquist, Esq., and Diane K. Rogell, Esq., Washington, D.C., for Clark Oil Producing Company and Diamond Shamrock Exploration Company; L. Poe Legette, Esq., Washington, D.C., for Minerals Management Service.

OPINION BY ADMINISTRATIVE JUDGE BURSKI

These appeals focus upon a gas reservoir located in the Gulf of Mexico, Vermillion Blocks 320 and 321. Sun Oil Company (Sun) is the lessee-operator of oil and gas lease OCS-G 2087 in Block 320 overlying a reservoir identified by its as the PL-6 No. 15 Sand Series reservoir. Shell Oil Company (Shell) is the lessee-operator of oil and gas lease OCS-G 2088 in Block 321 overlying the reservoir identified by it as the P Sand Series Reservoir A. On November 10, 1975, the Acting Conservation Manager, Gulf of Mexico Outer Continental Shelf (OCS) Region, Geological Survey (Survey), determined that a single competitive reservoir existed, required unitization, and ordered the parties to submit a proposed unit plan within 6 months.

Although the Sun group appealed this decision to the Director, Survey, the parties continued to negotiate a unit agreement. These negotiations were unsuccessful, however, causing the Conservation Manager on February 3, 1977, to propose a unit agreement to the parties. After some modifications suggested by the parties, the Conservation Manager directed the parties to sign the unit agreement, as modified, within 30 days and to submit a unit

operating agreement within this same period. 1/ On May 9, 1977, the parties executed the modified unit agreement (although the Sun group did so under protest) and submitted a unit operating agreement.

By letter dated April 21, 1977, Sun requested the Director, Survey, to stay the Conservation Manager's November 10, 1975, and March 23, 1977, orders requiring unitization. Though this request was denied on April 29, 1977, that denial was rescinded and the stay was granted on May 10, 1977. By letter dated May 17, 1977, Shell informed the Director, Survey, of its opposition to his grant of a stay. On June 1, 1977, Shell submitted a motion to vacate the stay. Shell suggests that it was informed at that time that a decision by the Director might be expected within 2 months after completion of briefing. Based on this information Shell asserts that it decided not to appeal the granting of the stay. 2/

In any event, the Director affirmed the decision of the Conservation Manager on February 7, 1979. Sun thereupon pursued an appeal to this Board. Contemporaneously therewith, Sun filed a motion for reconsideration with the Director, Survey. In the meantime, on February 23, 1979, Shell had filed with the Director a motion seeking clarification of the decision. Shell subsequently filed a motion to dissolve the stay and compel operation under the unit agreement. In light of these motions, the Solicitor's Office requested

1/ Letter to Shell and Sun, dated Mar. 23, 1977, from the Conservation Manager. A second appeal to the Director by Sun was filed in response to this order.
2/ See Motion to Dissolve Stay and to Compel Operation under the Unit Agreement, dated Apr. 20, 1979, at 15 n.15.

that this Board remand the case to the Director, Survey, so that he might rule on these questions. In a decision styled Sun Oil Co., 42 IBLA 254 (1979) (Sun Oil I), this Board granted the Solicitor's motion and remanded the matter to the Director, Survey. At the same time, the Board expressly ordered the stay be continued "unless and until the Director provides otherwise upon his assumption of jurisdiction of this case on remand." Id. at 259.

On June 5, 1981, the Director once again affirmed the decision of the Conservation Manager. The Director found the evidence established that the reservoir was competitive and that unitization would prevent the drilling of unnecessary wells. He also agreed with the allocation formula adopted by the Conservation Manager, holding it was a reasonable synthesis of two factors, viz., the amount of gas-in-place under Sun and Shell's leases and the productivity of their respective wells. The Director did modify his February 7, 1979, decision, changing the effective date of unitization from November 1 to November 14, 1975. This, in effect, altered the date of unitization from the date of issuance of the original unitization order to the date Sun received the order. Sun duly filed an appeal from the Director's June 5, 1981, determination. 3/

3/ Sun appealed on behalf of itself and other working interest owners of lease OCS-G 2087. These co-owners are. Anadarko Production Company (Anadarko), Diamond Shamrock Corporation (Diamond Shamrock), Northern Michigan Exploration company (Northern Michigan), Elf Aquitaine Oil and Gas Corporation (Elf Aquitaine), and Petro-Lewis Corporation (Petro-Lewis). Petro-Lewis had obtained its interest from Clark Oil Producing Company (Clark) in 1979, subject to Clark's right to participate in the on-going litigation to protect its pre-sale interest.

In Sun Oil Co., 67 IBLA 80 (1982) (Sun Oil II), the Board held that compulsory unitization of the P Sands reservoir 4/ was in the interest of conservation. As noted above, allocation of production from this reservoir was established by Survey using a formula based on both reserves and demonstrated production. Reserves were determined by isopach maps of the reservoir. Survey concluded that 81.1 percent of gas-in-place underlay Shell's lease and the remaining 18.9 percent underlay Sun's lease. Demonstrated production during the period from January 1 through June 30, 1976, was considered by Survey as representative. In these 6 months, Sun's share of production was 54.9 percent and Shell's 45.1 percent. Noting that during this period Shell had five wells in production and Sun three, the Board held these actual production rates to be so divergent from Survey's determination of the division of the reservoir volume that a hearing was appropriate to allow Sun an opportunity to establish by relevant evidence that the distribution of the gas-in-place was different from that determined by Survey. We assigned to Sun the burden of showing by persuasive evidence that the allocated reservoir shares were incorrect. Id. at 85. Additionally, the Board stated that it was unable to ascertain the basis for the 36 percent "weighting" factor utilized by Survey and noted that the parties "may wish to present evidence concerning whether or not this factor is arbitrary." Id. at 86. Finally, the Board ruled that the effectiveness of the unitization orders would be stayed until the matter was finally resolved within the Department.

4/ We use the term "P Sands" for the sake of simplicity to denote the common gas-bearing sands at issue here. See Sun Oil II, supra at 82 n.3 (1982).

On October 1, 1982, Shell filed a motion for clarification of the Board's decision in Sun Oil II. This motion sought express recognition that Sun was liable for interest on the value of Shell's portion of the gas that Sun had produced from the P Sands. This request was subsequently opposed by Sun. By order dated December 1, 1982, the Board denied the motion to clarify its decision, noting that "since the matter has been referred to the Hearings Division for appointment of an administrative law judge, Shell's request should be presented to him for initial consideration."

In order to facilitate the decisionmaking process before the administrative law judge, the parties agreed to submit written direct and reply testimony prior to the actual hearing date. Thus, the actual hearing was limited to cross-examination of the various witnesses on their written testimony and redirect examination and recross-examination, as necessary. Pursuant to this arrangement, Sun, Shell, and the Minerals Management Service (MMS) 5/ submitted extensive written testimony. Two days of hearings were held on April 19 and 20, 1982. More written testimony was exchanged and 2 additional days of hearings were held on June 15 and 16, 1982.

By decision dated July 24, 1984, Administrative Law Judge John R. Rampton, Jr., held that Sun had not shown by persuasive evidence that the original gas-in-place had been incorrectly apportioned to each lease. The weighting factor used by Survey in its allocation formula was sustained by

5/ The responsibilities of the Conservation Division, Geological Survey, were transferred to MMS by Secretarial Order No. 3071, 47 FR 4751 (Feb. 2, 1982). For purposes of convenience, the terms "Survey," "Geological Survey," and "Minerals Management Service" will be used interchangeably in this opinion.

Judge Rampton, and Shell was awarded simple interest at 7 percent for the value of gas produced by Sun in excess of its allocated share. Appeals from this decision were filed by all parties. 6/

[1] Sun's basic criticism of the gas-in-place division was that Survey failed to allocate a sufficient percentage of the reservoir to its tract. Sun contended, in essence, that numerous individual errors occurred which cumulatively resulted in undervaluing the net-acre feet of pay allocated to its lease and overvaluing the amount allocated to Shell.

Two of the alleged errors occurred in mapping the northeast portion of the reservoir. First, Sun argued that the isopach contours for the total interval of P Sands should have been drawn with a sharp turn to the northwest, with the effect that the gas-in-place allocated to the areas to the east of its A-5, A-10, and A-16 wells would be substantially increased. This was

6/ In addition to the co-owners identified in note 3 comprising the Sun group, Clark and Shell have also appealed. Subsequent to the filing of these appeals, a number of the parties entered into a settlement agreement, dated Nov. 15, 1984, stating that their interests in all unit operations would be in accordance with the terms of the unit agreement and joint operating agreement in dispute, except to the extent that these agreements were modified therein. As a result of this settlement, the following parties partially withdrew their appeals and requested that their appeals be dismissed insofar as they relate to each other: Shell Offshore, Inc. (successor to Shell Oil Co.), Sun Exploration and Production Co., Elf-Aquitaine, Anadarko, Northern Michigan, and MMS. Shell Offshore, Inc., Diamond Shamrock, Clark, Petro-Lewis, and MMS were identified as parties who had not settled as to each other and whose pending appeals would go forward against each other. Although it signed a stipulation announcing the settlement agreement, MMS noted that it was not a party to the Nov. 15, 1984, settlement and that, with respect to MMS, nothing in that agreement amended the unit agreement and joint operating agreement in dispute. Although Sun is no longer an appellant, we will, for the sake of convenience, continue to use the term "Sun" to describe those working interest owners in lease OCS-G 2087 whose appeal is still pending.

referred to by Shell as the "hairpin turn" argument. Sun also argued that additional land which should have been included in the reservoir in a northeasterly direction was not because Survey erroneously assumed that a fault existed in that portion of the reservoir. Sun further argued that additional land should have been included in the southeast. The addition of these areas resulted in a configuration which resembled and was referred to as the "Horn of Africa."

In addition, Sun contended that Survey showed a greater reservoir thickness underlying the Shell lease than was warranted because Survey had failed to consider the effect of a "bed boundary" error and had failed to normalize two of Shell's logs to account for anisotropic effects. Finally, Sun contended that Survey's isopach was clearly erroneous because Survey failed to account for the 130 bcf of gas which Sun contended was shown to exist in the reservoir.

Despite these numerous criticisms, Sun did not present an alternative division of reserves. Rather, the thrust of its argument was that the manifest difficulties in correctly delineating the reservoir militated against ascribing much weight to net-acre feet in an allocation formula.

Thus, Sun's Reservoir Engineering Manager for Offshore Development, W. Bartel Morgan, after noting that the Conservation Manager's estimate of acre feet was "far off," stated:

> There are not enough data available to determine with any confidence where the error in the Conservation Manager's estimate

> lies, or how it can fairly be corrected to arrive at a more accurate estimate of the relative volume of gas underlying each lease. Accordingly, Sun has not attempted to prepare a new estimate of relative acre-feet. The point of my analysis is simply to show that it is extraordinarily difficult to make an accurate estimate for this reservoir of acre-feet in relation to lease boundary lines. Because it is so difficult to estimate acre-feet in this reservoir, less weight should be given to acre-feet in the allocation formula in order to reduce the probability of error. [Emphasis added.]

Sun Direct Testimony, Morgan at 17.

For its part, Shell agreed with Survey's mapping of the reservoir with one major difference. It agreed with Sun that the total volume of gas in place was approximately 130 bcf. Unlike Sun, however, it did not believe that adjustments should be made in the northeast of the reservoir. Rather, it argued that Survey had erroneously excluded from the reservoir isopachs an area underneath its lease which Shell believed, on the basis of seismic data, originally contained gas-bearing P Sands.

MMS maintained its division of the reservoir was clearly justified by available data. 7/ It rejected Sun's hairpin turn and Horn of Africa arguments for increased allocation of reservoir volume in the northeast and southeast as being inconsistent with discernible trends and requiring an unjustified extrapolation beyond the control points. MMS also rejected Sun's argument that either a bed boundary error or a failure to normalize

7/ While Survey's original division of reserves was 81.1/18.9, its most recent analysis results in a 79.6/20.4 division. See MMS Direct Testimony, Introduction and Conclusions at 2.

Shell's logs resulted in an over-allocation of net pay to Shell. It similarly rejected Shell's contention that its seismic data indicated original gas-in-place in the southwest area of the reservoir, noting that such area could only have been gas-bearing if it were assumed to have been separated from the main reservoir by a sealing fault which gave way after the seismic data was obtained but prior to the measurement of well-hole pressure. Inasmuch as the initial measurement of well-hole pressure showed pressure communication throughout the reservoir, there was no possibility that the area could then contain gas-bearing sands because the area was lower structurally than the observed gas-water contact which would define the down-dip limit of the reservoir. Finally, contrary to the view expressed both by Shell and Sun that the total gas-in-place aggregated approximately 130 bcf, MMS argued that total gas-in-place aggregated approximately 107 bcf, an amount which comported with its most recent isopach. 8/

The Board has expressly noted in its referral of this case to the Hearings Division that Sun bore the burden of showing that the Survey division of the reservoir was incorrect. While Sun raised numerous questions as to the correctness or reliability of the Survey division, it also utilized the Survey estimates in its suggestions for an allocation formula, a matter

8/ Survey had originally estimated total gas-in-place to be approximately 86.6 bcf. Over time, the production history of the reservoir showed this estimate to be conservative. Survey's original estimate was ultimately revised upward to 107.1 bcf. A comparison of the original net gas isopach which served as the basis for the proposed unit agreement (MMS Exh. 3) with its most recent net gas isopach, drawn in light of Survey's new volume estimates (MMS Exh. 10), would show that, under Survey's analysis, even though the estimates of the total gas-in-place have risen substantially the relative division of net pay between Sun and Shell has remained reasonably constant.

examined infra. Thus, inferentially at least, Sun acquiesced in the reservoir division adopted by Survey. 9/

While Sun did not propose an alternate division, it did attack certain bases for Survey's determination. Thus, it premises a significant portion of its argument for a revised production allocation formula on what it perceives to be the unreliability of reservoir mapping techniques. It is, therefore, appropriate that we briefly examine some of Sun's substantive contentions on this issue.

It is generally recognized that reservoir mapping is not an exact science. But neither can it be gainsaid that substantial amounts of capital are ventured regularly based upon such estimates. The mere fact that such techniques are incapable of absolute precision or that experts may differ over the proper interpretation of data cannot, ipso facto, serve to invalidate reservoir mapping as a basis for production allocation. Moreover, it is abundantly clear that allocation of production on the basis of net-acre feet as ascertained from such mapping is the most commonly used approach for the OCS.

9/ It is true that testimony by Sam Park III, subsequent to that of Morgan, sought to assign 35.6 percent of the reservoir to Sun, as depicted in an updated isopach map (Sun Reply Testimony, Park at 11, Sun Exh. 26). Shell's Geological Engineering Consultant James A. Hartman testified, however, that this new isopach depicted a reservoir too small to accommodate the volume of original gas-in-place Sun contends existed, since its new isopach could accommodate only 92 bcf, far less than the 130 bcf Sun estimated to be present (Shell Rebuttal Testimony, Hartman at 8-9). No substantial response to Hartman's criticism of this new isopach was offered by Sun.

The evidence establishes that 82 out of 100 offshore units in existence allocate production on the basis of net-acre feet and 17 allocate on the basis of productive surface acres. Leaving aside for the present the question whether all of these units serve as a valid precedent for allocation where there are competing lessees, the fact remains that such allocation formulas implicitly accept the validity of reserve mapping. It is obvious that, while there may well be accuracy limitations in determining reservoir distribution, industry and other interested parties have sufficient confidence in the process to allow it to be the basis for determining their pecuniary remuneration. Although we do not share Sun's rejection of the utility of using reserve calculations as a basis for production allocation, we recognize that it is, of course, possible in any specific case to make errors which bring into question the ultimate result. We will, therefore, briefly address the specific criticisms leveled by Sun as to Survey's determination of reserves.

We will first turn to the question whether Survey inadequately credited Sun for net pay areas in Sun's portion of the reservoir. This involves consideration of both the hairpin turn and Horn of Africa arguments, though, of the two, the hairpin turn is far more important in increasing reservoir volumes underneath Sun's lease. 10/

10/ Thus, even were Sun shown to be correct in its assertion that additional lands should be included in the reservoir's exterior boundaries, the total increase in reserves attributable to Sun's lease would be approximately 0.8 percent. See Tr. 488. Indeed, since this calculation is based on the total increase of surface productive acres, as estimated by Sun as existing under its lease, multiplied by average thickness for the added areas, the 0.8 per percent also includes an additional extension of the reservoir in the southeast direction where a discernible extension appears in Sun's isopach (Sun Exh. 26).

The hairpin turn argument is predicated on Sun's conclusion that reservoir thickness increased in the area immediately to the east of the Sun A-10, A-5, and A-16 wells. Sun's contention is graphically shown on Sun Exh. 23, its total sand interval map. Sun derived its total net gas isopach maps (Sun Exhs. 25 and 26) by superimposing information from a percentage net sand map (Sun Exh. 24) on its total sand interval map. Sun obtained a "conservative" total net pay reading of 150 feet for the area on the east side of the reservoir. 11/

Both Shell and MMS attack this analysis as being a totally unjustified extrapolation beyond any control points, contrary to observed trends in the reservoir. Thus, Shell notes that proceeding from west to east from the Shell A-10 well, to the Shell A-22 well, to the No. 1 well (jointly drilled by Shell and Sun near the lease boundary) to the Sun A-5 well, the net thickness of reservoir-quality sand increases from 105 feet at the A-10 well to 220 feet at the A-22 well and then decreases at the No. 1 well to 143 feet and further diminishes to 77 feet at the A-5 well. See Shell Exh. 25. An even greater relative decline in total interval sand is observable between the No. 1 well and the A-5 well (declining from 255 to 125 feet). See Shell Exh. 26. A similar thinning trend is discernible between the Shell A-22 well and the Sun A-10 and A-16 wells. Shell argues that, despite this observed

11/ Paradoxically, Sun's "conservative" interpretation (Sun Exh. 26), while showing a decline in net pay on the northeast portion of the reservoir over that shown on its more "liberal" interpretation (Sun Exh. 25), not only substantially reduced allocated net pay on the Shell side of the reservoir, but actually increased net pay in the southeast portion of the reservoir underlying Sun's lease.

trend, Sun postulates that both the total interval P Sand and net pay increase dramatically as one proceeds east from the A-5 well. Shell urges the Board to reject such extrapolations as unsupported. MMS similarly finds Sun's analysis unsupported by any existing data (MMS Direct Testimony, Compton and Hrabec at 4).

Sun replies that there is evidence in support of its extrapolation because its three wells, A-10, A-5, and A-16 (which lie in a general northsouth line) show net sand increasing from south to north. Thus, A-16 shows 76 feet, A-5 shows 101 feet, and A-10 shows 132 feet of net sand, with the total sand interval for these wells being 306 feet for the A-16, declining to 125 feet for the A-5, and then increasing to 186 feet for the A-10. Sun suggests this trend justifies the hairpin turn in the reservoir thickness.

While the available data is not absolutely inconsistent with Sun's net gas isopach, we think it highly unlikely that Sun's interpretation correctly depicts reserve thickness. Thus, MMS Exh. 10, drawing on the same data, describes a much less complex reservoir which results in an isopach that does not depend on radical trend reversals outside of the area of well control and actually accounts for more gas-in-place (107 bcf) than does Sun's isopach (Sun Exh. 26, 92 bcf). This is particularly telling as Sun contends the reservoir contains a total of 130 bcf.

As recognized above, all extrapolations are based on inference outside points of control and complete certainty can never be achieved. The validity of any extrapolation is, therefore, dependent upon its consistency with both

known facts and observed trends. Rather than attempting to depict the most likely distribution given the various facts known about the reservoir, it seems relatively clear that Sun's net gas isopach was drawn to maximize the amount of gas attributable to Sun's lease. The mere fact that Sun's isopach did not actually contradict any of the data points scarcely means that it represents a more likely depiction of reserve thickness. To the extent, therefore, that Sun's analysis of reserve thickness is dependent upon the inferred existence of a hairpin turn, it is correctly rejected.12/

Regarding the Horn of Africa argument, we note an apparent disagreement between MMS and Sun on interpretation of data on the northeast edge of the reservoir. MMS argues that a fault terminates the reservoir along that boundary, while Sun contends that this fault does not exist and the reservoir's boundary is the known salt diapir. Sun's interpretation moves the northeast boundary further northeast. A similar expansion is also discernible toward the southeast. But, even were we to assume Sun was correct in both reservoir boundary placements, the evidence is undisputed that the increase in productive surface acreage is only 4.4 acres and the increase in net-acre feet is only 330. See Tr. 487-88. Thus, if it were assumed that

12/ Sun's only other support for its hairpin turn analysis is graphically depicted on Sun Exh. 22. Sun, relying on the fact that its portion of the reservoir is up-dip, points out that the Sun A-10 showed 132 feet of net gas sand and 15 feet of net water. Sun suggests that further east, the P Sand would eventually rise above the gas-water contact so that it could be presumed that a total of 147 feet of net gas sand would exist. The obvious fallacy of this argument is that it is premised on an assumption that the total net-pay thickness is constant. There is, however, no support in the record for such an assumption and, indeed, Sun's own analysis is premised on an increase in net pay as one moves east of the Sun A-10 well.

Sun was correct in its assertions, the total change in the reservoir would be less than 1 percent. So small a margin of error can hardly be said to undermine the reliability of isopach mapping.

Sun also alleges Survey erred in calculating the net sands it allocated to Shell's lease. Its criticism on this point is directed to the failure of Survey to take into account a "bed boundary" error and to "normalize" logs on two of Shell's wells (A-3 and A-9). Both of these problems arise, Sun asserts, because of the high angle at which Shell's wells penetrated the reservoir.

The "bed boundary" error relates to the fact that induction logs have a depth of investigation of approximately 3 feet, meaning that they "see" a distance of 3 feet beyond the well bore in all directions. Thus, in theory, a high angle well penetrating a reservoir might "see" and accordingly register the gas-bearing sands 3 feet before it actually penetrated those sands and for an additional 3 feet after leaving the sands. See Sun Exh. 40. The problem with Sun's argument resides in the fact that Survey determined its "net pay picks," i.e., determinations of the net gas-bearing portion of the sands, on the basis of three logs. In addition to the induction log, Survey used spontaneous potential (SP) logs and short-normal logs. The short-normal log has a depth of investigation of only 16 inches while the SP log has virtually no depth of investigation. Yet all three of the logs showed no appreciable differences. See Tr. 541, 563-64. We agree with Shell that whatever the validity of Sun's argument as a general matter, it clearly does not apply in the instant case.

Sun also argues that the logs from these two high angle wells should have been normalized to account for anisotropic effects. The term "anisotropic" is used to describe the properties of certain substances which result in significant differences in electro-conductivity in the horizontal and vertical planes. Thus, where a high angle well penetrates an anisotropic substance, measurement of conductivity and resistivity (measured in the induction and short-normal logs, respectively) could be considerably distorted.

While all parties recognized that shale exhibits anisotropy, there was general agreement that sand, particularly clean sand, is not nearly as anisotropic. See Tr. 543, 555. Charles Sever, however, testifying on behalf of Sun, did contend the sand sequence would exhibit a form of anisotropic effect known as macroscopic anisotrophy (Tr. 546-47). Don Pert, who participated on behalf of Survey in the 1976 meeting which determined net pay picks, was of the opinion that though normalization might be justified in some situations he did not agree that it should apply in this case (MMS Direct Testimony, Pert, Attachment 1, "Memorandum to Acting Oil and Gas Supervisor," dated Oct. 22, 1976). He specifically rejected normalization on the basis of anisotropic effects on the following basis:

> The major difference between USGS pay picks and those of Sun Oil seem to be in that they adjusted the conductivity values in two wells, thereby lowering resistivity values which lowered the amount of pay. Our interpretation is that these intervals have sufficient increases in resistivity above the shale base background to be productive regardless of this normalization they propose.

(MMS Direct Testimony, Pert at 2).

One of the difficulties in quantifying the impact Sun ascribes to Survey's refusal to normalize the logs to adjust for anisotropic effects arises because of Sun's failure to separately delineate the degree to which the bed boundary error supplemented any error generated by failure to consider anisotrophy. Sun's net pay picks for the two Shell wells represented its conclusions based on both allegations of error. We have rejected as unsupported in the present record Sun's arguments regarding the bed boundary error. While it is by no means a certainty, it would seem likely, given the number of net pay picks in each of the wells, that the alleged bed boundary error would have had a far greater effect on total net pay than errors relating to failure to normalize for anisotropic effects. Thus, the effect of failure to normalize for anisotrophy, by itself, might have only minimal impact on Survey's net pay determination for these two wells. We must find that Sun has failed to establish any significant error as a result of Survey's failure to normalize the well logs to account for anisotropic effects resulting from high angle penetration.

The last major criticism directed at Survey's reserve division relates to Sun's argument that the reservoir as described by Survey can contain only 107 bcf rather than the 130 bcf shown to be in the reservoir. We have noted, however, that this is an error in which Sun, itself, clearly partakes. Its most recent isopach shows even less gas-in-place than MMS's latest isopach.

While MMS admits that the original Survey estimates of gas-in-place were "conservative," it asserts its present estimates account for all of the gas-in-place within the reservoir. The predicate for this conclusion is

MMS's belief that original gas-in-place was only approximately 107 bcf, not the 130 bcf as now estimated both by Sun and Shell. The reason for this differential is that, unlike either Sun or Shell, MMS posits a relatively strong water drive in the reservoir, requiring various modifications to its reservoir computations.

Survey originally estimated that the reservoir contained 32,681 acre-feet of gas-bearing sands with an initial gas-in-place estimate of 86.6 bcf. See MMS Exh. 11. 13/ As subsequent production history clearly established that the gas-in-place exceeded 86.6 bcf, Survey had occasion to increase its reservoir estimate to 40,393 acre-feet with initial gas-in-place of 107.1 bcf. Sun, while admitting that it, too, originally underestimated the size of the reservoir, rejects Survey's most recent analysis as too low.

The focal point of the disagreement is whether or not the Shell A-9 well shows a strong water drive in the reservoir. Both Sun and MMS prepared analyses based on production history to ascertain original gas-in-place. Sun submitted what is referred to as a P/Z graph (Sun Exh. 12, Attachment A) which shows the relationship of pressure decline to cumulative gas production. Since, in the absence of water influx the P/Z plot will be a straight line, the total original gas-in-place was extrapolated to be 134 bcf. It was

13/ This figure is based on an estimate that the reservoir contained 2.65 MMCF per acre-foot. While Sun posited, at that time, that the net-acre feet of the reservoir totalled 37,422, considerably more than the Survey original estimate, its total gas-in-place estimate was 88,728, only slightly more than Survey. This was a result of Sun's estimate that the reservoir contained only 2.371 MMCF per acre-foot. See Sun Exh. 11.

admitted, however, that in preparing this graph, data obtained from the Shell A-9 was ignored. Sun argued that the A-9 well had apparently watered out at that time and, therefore, its pressure readings were irrelevant because the well was no longer in pressure communication with the reservoir. See Sun Exh. 12 at 2 n.1; Tr. 85.

The Shell A-9 well played a critical part in MMS's analysis as the basis for its conclusion that a strong water drive existed, a fact which would undermine Sun's reliance on a straight P/Z plot. In addition, MMS presented testimony asserting that material balance calculations were in a range of between 104 to 117 bcf, with the average being 106.6 bcf. See MMS Direct Testimony, Durr and Tschoepe at 2-3. The method utilized to compute this range of values was developed by Havelena and Odeh.

The Havelena and Odeh methodology, however, was sharply criticized by Sun's expert witness, Morgan, who noted that the problem with that methodology is that it does not result in any one answer, but in a number of reservoir-aquifer pairs which satisfy the material balance equation. 14/ Morgan further testified that, precisely because of this problem, the Havelena and Odeh methodology had been attacked by other experts as resulting in unreliable conclusions (Sun Reply Testimony, Morgan at 7-8). In

14/ Sun noted that the Havelena and Odeh approach "used the Hurst-Van Everdingen method of describing a possible aquifer, and adjusting the aquifer description by trial and error until a match was found for the pressure-production performance using the material balance equation" (Sun Reply Testimony, Morgan at 7).

rebuttal, MMS's expert, Vivian Tschoepe, testified that while she was familiar with the criticisms, she disagreed with the general conclusion that the Havelena and Odeh method was unreliable in all cases. See Tr. 331.

Clearly, on this matter we have a conflict among experts who present plausible analyses supportive of their position. This Board has the full power of the Secretary to review de novo all matters within its jurisdiction. See Exxon Company, U.S.A., 15 IBLA 345 (1974). But, even where the Board exercises its full de novo review authority, the Board, as does the Secretary, has the right to rely on the reasoned conclusions of the Department's technical experts. In such a situation, the record is not a tabula rasa on which an appellant must merely inscribe his view in order to carry the day. Rather, an appellant must, by a preponderance of the evidence, establish error in the technical conclusions which he challenges. It is not enough to show a possibility of error or that reasonable minds may differ in their interpretation of the data or in the formulation of the conclusions. What must be shown is that error, in fact, occurred. In the instant case, while appellant has presented a plausible analysis of original gas-in-place which is supported by expert testimony, appellant has failed to undermine the plausibility of MMS's updated analysis. Thus, Sun has failed to carry its burden.

We must, however, take note of the fact that subsequent production history has resulted in a recomputation by MMS of the relative shares of the original gas-in-place, reducing Shell's percentage of net-acre feet of P Sands from 80.1 percent to 79.6 percent. Judge Rampton, doubtless owing to the fact that Sun essentially waived this question, affirmed the original

Survey division. This Board, however, in the full exercise of its de novo review authority is not limited to consideration of only those issues pressed by the parties (see, e.g. United States v. Gassaway, 43 IBLA 382, 388 (1979)). The fact appellant may have waived this issue does not bar any action on our part in correcting perceived errors. It is our view that in determining the amount of gas which is attributable to Shell's tract the more recent apportionment by MMS, i.e., 79.6/20.4, should be used, and we so direct. 15/

In summary, after a thorough review of the various challenges made by Sun to Survey's reservoir division we find, in the full exercise of our de novo review authority, that the division of the reservoir depicted in MMS's most recent isopach is correct.

[2] The second issue referred for hearing was whether the weighting factors used by Survey in its allocation formula were arbitrary. This formula is set forth in exhibit C of the unit agreement:

Tract 1 [Shell] Participation = 0.64(81.1) + 0.36(45.1) = 68.14%
Tract 2 [Sun] Participation = 0.64(18.9) + 0.36(54.9) = 31.86%

The weighting factors that we must examine are 0.36, the weighting factor derived from production during the period January 1 through June 30, 1976,

15/ Effectively, under Survey's allocation formula this would decrease total production attributable to Shell's lease from 68.14 percent to 67.68 percent. While such alteration should be made on remand, our discussion on the allocation formula, set out infra in the text, will, for the sake of convenience, utilize Survey's original division as all of the arguments of the parties were premised thereon.

and 0.64, the weighting factor applied to reserves (1.00 minus 0.36). The 0.36 weighting factor represents the difference between Shell's share of reserves (.811) and its share of production (.451) during the aforementioned 6-month period.

Our decision to examine whether Survey's weighting factor was arbitrary reflects a longstanding policy of this Board to place great reliance on the reasoned analysis of Survey in matters concerning geological evaluations. Shaw Resources, Inc., 66 IBLA 57, 61 (1982). Thus, it is not enough in the instant appeal that Sun offer other possible allocation formulas. As we noted in Tenneco Oil Co., 57 IBLA 85, 89 (1981), an appellant objecting to Survey's allocation formula must demonstrate that such formula is not an appropriate method of allocating production by offering a clearly superior alternative.

Three arguments are presented by the Sun group in seeking to establish the arbitrariness of Survey's allocation formula. First, the formula awards Shell more than it could have obtained in the absence of unitization by drilling three additional wells; second, the formula assigns too little weight (0.36) to production, and finally, the formula is based on an erroneous production percentage (45.1) because the time span used was not representative of production over the life of the reservoir.

Sun's first argument is that, as a conceptual matter, Shell should not receive any more, based upon Survey's allocation formula, than Shell could have produced in the absence of unitization. Though Shell disputes

how many additional wells it would have profitably drilled absent unitization, Shell's Staff Engineer in Production Administration, Harold O. Amadon, testified that Shell's plans for additional wells were effectively stopped by Survey in early 1975. According to Amadon, J. Rodgers Pearcy, Acting Deputy Conservation Manager of the Gulf of Mexico OCS Region, advised him that existing well spacing was far closer than that normally required to effectively deplete a gas reservoir of this type and that Shell should not do any unnecessary drilling. See Shell Direct Testimony, Amadon at 8; Shell Exh. 2. Thereafter, Survey ordered unitization of the instant reservoir in the interest of conservation to prevent the drilling of unnecessary wells.

Sun contends that prior pleadings of Shell indicate that Shell would have profitably drilled at most three additional wells. See Reply Memorandum of Petro-Lewis, Appendix A. Sun contends that, even if it were assumed these three wells were as productive as Shell's A-22 (the most productive Shell well), Shell's share of total production would have been 51.63 percent in the absence of unitization, rather than the 68.14 percent allocated by Survey. Sun argues that Shell should be awarded no greater share of production than it could have obtained had there been no unitization.

We note, however, that while such an approach conserves Shell's expenditures and protects environmental values, it also provides an incentive to drill, as did Sun, in an unusually dense pattern near the common lease line. 16/ Moreover, as Shell points out, implicit in such a theory

16/ In an Aug. 18, 1976, memorandum from the Conservation Manager to the Acting Chief, Conservation Division, Sun's well density of one well per

is the right of Sun to substantially drain that portion of the reserves beneath Shell's lease. As such, it represents a departure from the result approved in Tenneco Oil Co., supra. We also note that Sun's theory involves considerable speculation. It is premised on expectations that the three wells would match and not exceed the productivity of the Shell A-22 well and that the three wells would not have impacted on the production dynamics of the reservoir. Ultimately, however, it proceeds from assumptions as to the relationship between the law of capture and unitization which deserve greater examination.

In Tenneco, a net-acre feet allocation was affirmed on appeal in a situation where, as here, the operator of a lease overlying a small part of the original reserves drilled early and aggressively along the lease boundary and thereby produced more hydrocarbons. Id. at 88. Despite this result, we intimated in Tenneco that situations might arise where recourse to net-acre feet allocation would not fairly treat all unit participants. Accord, Texaco Inc., 51 IBLA 332, 87 I.D. 648 (1980). The instant case is the first compulsory offshore unit on appeal in which Survey has varied from an allocation

fn. 16 (continued)
46 acres was described as "much closer spacing than normal for gas wells in the Gulf of Mexico" (Shell Exh. 8). Amadon argued that Sun's well density was "unusually high and far in excess of what was necessary to deplete its share of the reserves" (Shell Direct Testimony, Amadon at 7). Despite these views, the Conservation Manager approved Sun's plan to drill its three wells (Reply Memorandum of Petro-Lewis at 8, n.1). Unlike the situation onshore, no well spacing requirements or production allowables have been adopted for offshore development. To the contrary, in para. 14A of OCS Order No. 11, 39 FR 15889 (May 6, 1974), Survey states that the location and spacing of wells is determined independently for each lease or reservoir, in a manner which will locate wells in the optimum structural position for the most effective production of reservoir fluids and to avoid the drilling of unnecessary wells. As to the location of Sun's wells near the common lease line, see Sun Exh. 4 (MMS Exh. A).

based strictly on reserves (net-acre feet). In the case now before us, Survey has recognized a second element in adopting its allocation formula, viz., actual production over a 6-month period. To the extent that Survey's formula allocates Shell less than 81.1 percent of production, Sun production depletes Shell reserves. Sun argues that all it seeks to do is utilize Survey's own formula but change the production figures to represent actual production since the unit plan was ordered. 17/ Sun argues that the resultant percentage allocated to Shell (53.81) is greater than that which Shell would have obtained in the absence of unitization (51.63) and Shell has no cause for complaint.

In support of its formula allowing substantial drainage of Shell, Sun asserts that the rule of capture remains fully applicable to the OCS. Under this principle, the owner of a tract of land acquires title to the oil and gas only when he reduces the oil or gas to his possession. Thus, he obtains title to all that he produces even though it may be proved that part of such oil or gas migrated from adjoining lands. See Hardwicke, "The Rule of Capture and Its Implications as Applied to Oil and Gas," 13 Texas L. Rev. 391, 393 (1935). Sun points to the preamble to 1980 regulations wherein the Assistant Secretary stated:

> Generally, unitization will not be authorized solely to protect correlative rights. A lease does not grant lessees the

17/ Sun would allocate as follows:
Shell's share = .4775(81.11) + .5225(28.86) = 53.81%
Sun's share = .4775(18.89) + .5225(71.14) = 46.19%
where .5225 is the difference between Shell's share of reserves (.8111) and Shell's share of production (.2886) during the period from Nov. 14, 1975, through June 30, 1982. See Sun Direct Testimony, Morgan at 13.

> ownership of minerals in place, and the Law of Capture applies to the development and production of OCS minerals. However, where development rights are constrained so that different lessees with separate rights to develop a common resource have unequal development opportunities, and the inequality was not apparent at the time the leases were offered, unitization may be authorized to protect correlative rights. [18/ emphasis added.]

45 FR 29280, 29281 (May 2, 1980).

Sun also argues that the parties have accepted the rule of capture by their onshore practice of allocating primary production 19/ on the basis of actual production. Sun Exh. 15 summarizes the factors used as the basis of allocation formulas for 22 voluntary, onshore units in which both Sun and Shell participate. Judge Rampton found most of these formulas allocating primary production to be based exclusively on production. Underscoring this fact, Sun's Manager of Unitization, Joseph Thornton, testified that the dominant factor in allocation formulas of "hundreds or even thousands" of onshore field units during primary recovery is related to productivity, i.e., what each of the separate tracts could have produced under competitive conditions

18/ As defined in OCS Order No. 11, supra note 16, "correlative rights" means "the opportunity afforded each lessee or operator to produce without waste his just and equitable share of oil and gas from a common source of supply." Regulations at 30 CFR 250.2(i) (1985) provide:

> "'Correlative rights,' when used with respect to lessees of adjacent tracts, means the right of each lessee to be afforded an equal opportunity to explore for, develop, and produce, without waste, oil or gas, or both, from a common source."

19/ "Primary production" is production from a reservoir by primary sources of energy, i.e., from natural energy in the reservoir when it is in an early stage of production, with little loss of pressure and with most wells still flowing. Williams and Meyers, Manual of Oil and Gas Terms (1984) at 669. See also Sun Direct Testimony, Thornton at 3. All production in the instant appeal is primary production.

without unitization (Sun Direct Testimony, Thornton at 4-5). Moreover, Sun notes that the inherent uncertainties in estimating the division of reserves require that greater weight be assigned to production.

Shell distinguishes the 22 onshore units in Sun Exh. 15 by noting that these units were formed to facilitate secondary recovery. Shell also points out that Sun's expert Thornton testified that during the secondary recovery phase the largest percentage of an allocation formula is usually based on hydrocarbons in place. See Shell Response Brief at 27. Moreover, Shell continues, the 22 units involve oil, not gas, fields, as here. See Tr. 170-71. To the extent onshore practices are pertinent, Shell argues, Survey's formula is wholly consistent with the units set forth in exhibit 15. 20/

Shell and MMS focus their attention on what they assert is consistent practice in determining offshore allocation formulas. Of the 100 units in the Gulf of Mexico, Pearcy testified that 82 allocate production by net-acre feet, 17 by surface acres, and one by a formula assigning 50 percent weight to production and 50 percent weight to net-acre feet. This last unit, MMS points out, was formed to facilitate secondary recovery (water flooding).

20/ In this vein, Shell maintains that since state conservation agencies onshore have almost uniformly adopted well spacing requirements and production allowables, which protect against drainage by one operator of the reserves underlying the lease of a neighboring operator, there is little practical difference between an allocation based on production and an allocation based on reserves (Shell Direct Testimony, Amadon at 18). Sun disputes this view, pointing out that if an owner fails to drill enough wells on his lease or if the quality of his wells is too poor to produce their allowables, the state conservation agency will not curtail his neighbor's wells to prevent drainage, nor will the agency require his neighbor to share the fruits of prudent development (Sun Reply Testimony, Thornton at 5-9).

See MMS Direct Testimony, Pearcy at 4, as amended, on Apr. 6, 1983. Thus, 99 of 100 offshore units base allocation exclusively on reserves. Id. Moreover, Amadon, testifying on behalf of Shell, contended that, with the exception of the instant case, production has never been a factor in the allocation formulas of the 60 offshore units in which Shell has participated (Tr. 346; Shell Exh. 12).

Sun challenges Pearcy's statistics pointing out that, of the 100 units, 5 were compulsory and 3 of these were appealed. The frequency of appeal, Sun argues, suggests there exists no consensus in the industry for offshore allocation. Sun further argues that the remaining 95 voluntary units provide little meaningful precedent because 61 of those involved only one lessee. 21/ An additional 21 involved more than one lessee, but either the unitized leases were jointly owned by the same lessees, or the lessees had entered into an agreement establishing an allocation formula before development. Sun maintains that none of these 21 are precedential here because the instant appeal involves 2 competing lessees who developed their leases prior to the establishment of an allocation formula. Thus, out of 95 voluntary units, Sun finds only 13 to have been negotiated at arm's length after development.

Of these 13, Sun states that 8 were negotiated during the same time period for eight sand reservoirs in the same field. Two of the four parties had interests in all eight units, and the other two owned joint interests in

21/ Pearcy testified that 45 units were formed offshore in which part of the reservoir was on Federal land and part on Louisiana land. The great majority of these involved only one lessee (Tr. 274).

three of the units. In Sun's view, negotiation in this type of situation is simplified because there is more room for compromise from one reservoir to another. No apparent explanation exists for the allocation formulas of the remaining five units, Sun maintains, and one of these units, the West Delta Block 73, F-40 Sand, Reservoir A, has an allocation formula based 50 percent on net-acre feet and 50 percent on production. The remaining four units have allocation formulas based on reserves, Sun notes, but they constitute too small a sample to provide any meaningful precedent.

The record assembled by the parties indicates a clear distinction in the manner in which primary production is allocated onshore and offshore. Offshore allocates by reserves and onshore predominantly by production. The reasons for this distinction, however, are less clear. Steven E. Whiteside, Division Reservoir Engineer for Shell, points out that the onshore fields summarized in Sun's Exh. 15 are older producing areas subject to multiple ownership interests. Whiteside suggests that available well logs are usually older and less sophisticated than those for OCS wells and, consequently, are subject to greater differences in interpretation (Shell Direct Testimony, Whiteside at 13). Evaluation of underlying reserves in many of these onshore reservoirs is also difficult because of the existence of massive carbonate pay zones, which are geologically quite different from the P Sand. Id. Finally, the existence of a large number of onshore interest owners makes the effort to reach agreement based upon projection of the size and location of these reservoirs much more difficult. As a result, in many cases the only reliable records reasonably acceptable to all parties are production records. Id.

Sun, however, rejects Shell's reasons for the distinction. Citing the onshore units in Sun Exh. 15, Sun notes that the relationship between productivity factors and hydrocarbons-in-place factors is about the same whether the logs are old or new, and whether the reservoirs are carbonate or sandstone. As to the number of interest owners in an onshore unit, Sun argues that the industry's onshore unitization experience has been enriched by these difficulties.

Ultimately, of course, Sun's position is premised on its view that the law of capture should be the critical reference point for the determination of production allocation from a common reservoir. Admittedly, as a historical matter, the law of capture recognized fee ownership as providing, at most, merely an equal opportunity to produce from a common reservoir. To no small degree, this approach was dictated by the difficulties attendant in delimiting an underground reservoir in the early days of oil and gas production. See, e.g., Stephens County v. Mid-Kansas Oil & Gas Co., 113 Tex. 160, 167, 254 S.W. 290, 292 (1923). It was a logical and rational method of determining ownership given the limited capabilities of that era in ascertaining the nature and distribution of hydrocarbons beneath the earth's surface. It also served to put a premium on development since ownership of the oil and gas only arose upon production. Rapid development was thereby essential in order to protect the surface owner's interests, particularly where adjoining lands were under development.

But, as is often the case, the rule of capture fostered a number of unwelcomed side effects. Because ownership of oil and gas was dependent upon

reducing them to the individual's possession, a race to produce was inevitably generated. This often resulted in the drilling of wells which, while unnecessary to adequately drain the reservoir, were deemed essential to prevent drainage by wells on adjoining tracts. Moreover, since an individual would own only that which he produced, production practices which maximized an individual's production, even though they resulted in lower total field recovery, were encouraged. Finally, the nature of ownership patterns of small individual tracts made attempts to implement secondary recovery techniques virtually impossible in the absence of established procedures for permitting and, if necessary, compelling full field development on a unified basis.

In light of these conservation concerns, the oil producing states both by statutory enactments (see, e.g., N.M. Laws 1935, ch. 72, § 12; Okla. Laws 1935, ch. 59, 3; Okla Stat. Ann. §§ 85-87, 136-38; La. Rev. Stat. Ann. § 30:5(B)) and judicial decisions (see, e.g., Halbouty v. Railroad Commission, 357 S.W.2d 364 (Tex. 1962)) adopted procedures which authorized forced pooling of lands for purposes of well spacing, as well as voluntary and permissive unitization of entire fields to allow maximum recovery of hydrocarbons. But, what must be clearly seen is that these enactments, particularly in their mandatory aspects, represented a repudiation of the untrammeled law of capture as it had existed in earlier years.

As a necessary corollary to mandatory unitization and forced pooling, it became necessary to adopt procedures for allocating production. Obviously, inasmuch as the result of such actions was the affirmative limitation of the

right to drill, actual production could no longer serve as a valid basis for apportioning production as some parties could be absolutely barred from drilling any wells on their properties. 22/ The question then became one of devising appropriate formulas for allocation of production.

In examining this question it is clear that numerous and varying formulas have been used by those possessed of competing interests in a common reservoir. So long as the parties agree and the Government's royalty interest is not adversely affected, it would seem a matter of no concern to the Department whether the division of the production proceeds on net-acre feet, net productive surface acres, actual production, structural advantage or any combination of these factors. In the absence of such an agreement, however,

22/ In this regard, Clark and Diamond Shamrock's argument on appeal that actual production from the P sands should be the sole determinant for allocation of the gas must be rejected out of hand. See Statement of Reasons in Support of Appeal of Clark and Diamond Shamrock at 12-15. Carried to its extreme, this approach would make unitization a tool by which the first developer of a common reservoir could, be the simple expedient of drilling enough wells to adequately drain the reservoir, prevent other parties not only from sharing in the proceeds but from even drilling their own wells. To argue that this somehow preserves correlative rights is ludicrous.

While Clark and Diamond Shamrock suggest that production only during the period from January 1 through June 30, 1976, (resulting in an allocation of 54.9 percent to Sun and 45.1 percent to Shell) should serve as the basis for division rather than total production through 1982, this suggestion ignores the fact that the Conservation Manager, GS, had already advised Shell that further wells would be unnecessary and, indeed, had ordered unitization on Nov. 10, 1975. Thus, production during the period in question should not, under any theory of allocation, be the sole determinative factor in dividing the reserves. Shell's productive abilities had already been circumscribed by Survey. In any event, as the subsequent text will make clear, it is the Board's view that net-acre feet should, as a general rule, be the basis for allocation of reserves from a common reservoir when MMS requires mandatory unitization.

it becomes necessary to determine what is, in fact, the preferred method of allocation.

Generally speaking, the Board grants considerable weight and deference to the determination of MMS on such matters as it is the Secretary's expert, and this Board is entitled to rely on its reasoned conclusions. More specifically, inasmuch as MMS is not directly affected by the allocation of production, its formulation will generally be untainted by those special concerns which necessarily color the views of the interested parties. Beyond that, however, it is the Board's view that, as a general matter, where mandatory unitization of an OCS reservoir has been ordered and the parties are unable to agree among themselves on allocation of production, allocation based upon relative net-acre feet should normally be directed.

We recognize, of course, that while this conclusion is consistent with our past pronouncements (see, e.g., Tenneco Oil Co., supra; Texaco Inc., supra), Sun has argued that it is inconsistent with both onshore practice and the law of capture. However, unitization is, itself, not consistent with the law of capture as originally developed and, indeed, mandatory unitization was developed precisely because the law of capture impeded optimum recovery of oil and gas. Thus, rigid fidelity to the law of capture in determining production allocation within the context of mandatory unitization is incompatible with the animating purposes of unitization. What is essential, however, is that the formula adopted be fair to the competing interests of the lessees.

In this regard, we find it difficult to discern how a formula which grants each lessee the gas-in-place under its lease can be said to be

unfair. 23/ Sun, however, suggests that such an approach removes all incentive for rapid development of leases in areas where no hydrocarbons are known to exist. This is simply not true. First of all, unitization is ordered only after a showing that a competitive reservoir exists. Moreover, as a general rule, unitization on the OCS is effective as of the date of approval of the unit plan by the authorized officer. Thus, all production occurring prior to the effective date of the unit agreement is not subject to allocation under the agreement, and is solely owned by the lessee who produced it. In this specific case, Sun produced 12 bcf prior to the effective date of the unitization agreement. This production was not subject to the unit allocation formula and Sun retained all of it. We think that this aspect of the law pertaining to unitization more than adequately provides incentives for the rapid development of federal leases on the OCS and compensates the earlier developer for such risks as might have been undertaken. 24/ The dilatory developer is, thus, subject to the very real possibility that substantial reserves beneath its lease will be drained, for which it will receive no compensation, until such time as it can establish that there is a common reservoir underlying its and its neighbor's lease.

23/ We recognize that a number of OCS units have allocated production on the basis of productive surface acres. While such an approach has the advantage of simplicity of calculation, the failure to consider relative thickness of a reservoir makes it less likely that a formula based on surface acres will actually result in a distribution of production which mirrors the subsurface hydrocarbon accumulations.
24/ In the instant case, we note Sun and Shell had jointly drilled the No. 1 well prior to Sun's development of its lease, and this well had shown significant hydrocarbon accumulations in the P Sands. Thus, while the extent of the deposit would remain somewhat speculative, the risks which Sun took in aggressively developing its lease were not as great as would be the case for a rank wildcat area.

Nothing we have said is inconsistent with the 1980 declaration of the Assistant Secretary that "[a] lease does not grant lessees the ownership of minerals in place, and the Law of Capture applies to the development and production of OCS minerals." 49 FR 29280 (May 2, 1980). This statement must be read in tandem with the line immediately following, to wit, "However, when development rights are constrained so that different lessees with separate rights to develop a common resource have unequal development opportunities, and the inequality was not apparent at the time the leases were offered, unitization may be authorized to protect correlative rights." Id.

In the instant case, the law of capture did originally apply. This, indeed, is the theoretical basis on which Sun is allowed to keep all of its pre-unit production, even though a substantial portion of such production represents drainage from Shell's tract. But, upon the determination of the Conservation Manager that the reservoir was competitive and no further wells were needed to adequately drain the P Sands, Shell's ability to further develop its lease was effectively terminated. At that point, the law of capture was no longer applicable to the allocation of production.

It is, of course, true that in this case Survey has deviated from a straight net-acre feet allocation to one which does give some consideration to production during the 6-month period between January 1 and June 30, 1976. In the past, the Board has intimated that in unusual circumstances such a variance might he justified. See, e.g., Texaco, Inc., supra at 355, 87 I.D. at 660; Tenneco Oil Co., supra at 87. It seems possible that, in the instant case, Survey determined that Sun's clear structural advantage

warranted a variance from a strict net-acre feet allocation. 25/ Whether such a modification was justified by this or any other consideration we need not determine. Shell, the party adversely affected by the consideration of actual production, has seen fit not to challenge Survey's allocation formula. Therefore, we can find no compelling reason to revise the allocation formula to remove any consideration of production, particularly since MMS did not have cause to directly address its reason for varying from net-acre feet. However, having decided to accept MMS's variance from a straight net-acre feet allocation in this case, it becomes necessary to examine Sun's basic contention that other variants represent clearly superior allocation formulas. But, to the extent Sun's appeal is premised on the concept that any allocation formula developed under a mandatory unitization directive should attempt to result in an ultimate division similar to that which would obtain in the absence of unitization, it must be rejected. 26/

25/ In its Mar. 23, 1977, letter to the parties containing the unit agreement at issue, Survey set forth those factors that it sought to recognize in its allocation formula:

"The participating formula (USGS Exhibit C) for the PL-15 reservoir is designed to recognize productive capacity and the interpreted original reservoir volume associated with each lease and to express this recognition in a proportion that reflects the effective contribution of each lease to unitized operations.

"It is our opinion that productive capacity should be recognized and assigned credit in the allocation formula in the specific case of the PL-15 reservoir. The participating formula reflects: (a) recognition of structural position, (b) demonstrated well capacity, (c) the ability of wells to sustain efficient reservoir depletions with time, (d) the demonstrated productive capacity relative to interpreted reservoir volume under each lease, and (e) proved net effective feet of gas saturated sand observed to underlie each lease as determined from subsurface control and portrayed by rigorous mapping techniques."

26/ Moreover, as we indicated earlier in the text, the assumptions necessary to even attempt to determine relative production in the absence of unitization would make any resulting apportionment highly speculative and, thus, actually increase the possibility of an unfair result.

[3] Sun's second argument is that insufficient weight was given to production. Although Sun's witness Thornton testified to the "hundreds or even thousands" of onshore units allocating primary production on the basis of a production factor, the 22 units Sun offered in support of its position in exhibit 15 were formed for secondary recovery. We agree with Shell that, in these 22 units, the allocation formula for primary phase recovery is less likely to be of importance to the interest owners. 27/ As a result, we do not find that this onshore practice supports Sun's second argument in favor of increasing the weight assigned to production in Survey's formula.

Offshore, the practice is directly contrary to increasing the weight assigned to production. The five prior compulsory units, for example, assigned no weight whatsoever to production. The same is true of those units that cross the State-Federal boundary in the Gulf and involve but a single lessee. Although these units are factually distinguishable from the unit on appeal, they do reflect a choice by the royalty interest holders involved (two competing interests in a common reservoir) to share the royalty portion of production according to a formula based exclusively on reserves. While the existence of different royalty rates would obviously preclude

27/ Sun maintains that Shell's argument reveals a complete misunderstanding of how onshore unit allocation formulas work. Primary recovery does not end when secondary recovery operations begin, Sun contends, but rather when the unit has produced all the oil and gas that would have been produced in the absence of secondary recovery operations (Reply Brief at 14). Yet, Sun's own witness, Joseph Thornton, testified that when an onshore unit formed for secondary recovery becomes effective, well patterns are changed, additional wells are drilled for injection, and the whole pattern of the unit productivity changes (Tr. 169).

allocation solely on production, since a lessee would, to the extent possible, confine production to the lease with a lower royalty rate, it would still have been possible to devise a formula which factored in elements such as structural advantage. Yet, none of these single lessee units considered this aspect -- which is ultimately related to the ability to produce. Therefore, these units are entitled to our consideration. The 13 additional units (eight of which were negotiated during the same period for eight sand reservoirs in the same field) do not support a contrary conclusion. All but one allocate exclusively on the basis of reserves, and the one unit assigning a 50 percent weight to production was formed for secondary recovery.

Sun also argues that increased weight should be accorded to production because of the uncertainties of reservoir mapping. We note that Judge Rampton referred to both this consideration and the general prevalence of the law of capture onshore in noting that, were he not constrained by prior Board precedent, he would give equal weight to production and reserve factors. We disagree.

First of all, we have already noted that unitization represents an essential departure from the law of capture, in that it affirmatively limits the rights of lessees to fully develop their leases. It is functionally inconsistent to first limit a lessee's right to develop and then base allocation on a factor which penalizes the party whose right to develop has been constrained.

With respect to the alleged difficulties inherent in mapping the reservoir, we have addressed Sun's specific complaints in some detail already.

Suffice it, here, for the Board to observe that, while we recognize that some degree of uncertainty is present in any such activity, we cannot agree with either Sun or Judge Rampton that this specific reservoir was exceptionally difficult to map, 28/ or that mapping in general is so imprecise as to yield inherently unreliable results. Indeed, the fact that both Judge Rampton and Sun would still premise 50 percent of the allocation formula on Survey's initial reservoir division undercuts the argument that reservoir mapping techniques are too unreliable to serve as a basis for the allocation of production. We must reject Sun's argument that increased weight should be afforded to production in the allocation formula approved by Survey. 29/

Sun's third argument seeking to establish the arbitrary nature of Survey's allocation formula is the contention that this formula is based on erroneous production percentages. The production percentages in Survey's formulas are underscored below:

28/ MMS and Shell agreed that the instant reservoir was a typical Gulf of Mexico reservoir (Tr. 294, 658). Shell's Hartman, who testified that he had mapped in detail hundreds of reservoirs, used only standard techniques in mapping this one (Tr. 659).

29/ Subsequent to Judge Rampton's decision herein, the Court of Appeals for the Tenth Circuit held that the traditional standard of proof, viz., a preponderance of the evidence, is the proper standard to be applied to a factual determination whether certain lands overlie a known geologic structure. Bender v. Clark, 744 F.2d 1424 (10th Cir. 1984). However, where, as here, the issue is whether Survey's allocation formula, and particularly the weighting factors therein, adequately compensates the parties, the issue calls more for the exercise of discretion and judgment than for a factual determination. Accordingly, the Bender holding is seemingly inapposite with respect to this issue. Should it be held that Bender does apply in this situation, we hold that the evidence assembled by Sun does not overcome by a preponderance of the evidence Survey's determination in this respect.

Tract 1 [Shell] Participation = 0.64(81.1) + 0.36(45.1) = 68.14%
Tract 2 [Sun] Participation = 0.64(18.9) + 0.36(54.9) = 31.86%

Sun objects to Shell's 45.1 production percentage, contending that it is based on an unrepresentative 6-month period from January 1 through June 30, 1976, during which, Sun concedes, Shell's share of production was 45.1 percent. In support of its argument Sun notes that its share of production during the period from November 14, 1975, through June 30, 1982, amounts to 71 percent (Sun Exh. 8). Sun contends its disproportionate share of total production is the result of its superior structural position and sustained production. Thus, it correctly notes that two of Shell's wells watered out before Survey ordered the parties to sign the unit agreement in March 1977, and a third watered out shortly thereafter (Sun Exh. 6; Tr. 397). In place of Survey's 6-month period, the Sun group argues that the formula should be corrected to reflect Shell's share of production (34 percent) at the time the formula was adopted or, alternatively, that it reflect the complete production experience.

At the hearing, Pearcy explained why Survey chose the 6-month period:

> We deemed it was a representative period because it was a period when all the wells on both leases were producing.
>
> It was also a period prior to the time that unitization was ordered. That is, the final unitization agreement was submitted to the parties to subscribe to.
>
> It was also a period when both parties were negotiating or attempting to negotiate a unit.

(Tr. 266).

Although time has shown this 6-month period to overstate Shell's share of ultimate production by approximately 16 percent (0.451 less 0.2886) of reservoir reserves, Survey's method was a reasonable one. As Pearcy notes, Survey chose a period when all wells were in production. To have done otherwise, we think, would invite a finding of arbitrary action.

Survey's choice of a period prior to the formation of the unit agreement also appears reasonable because it allows the parties to make unit decisions with a fixed allocation formula in mind. Pearcy explained Survey's reasoning in this way:

> Unitization allows for the reservoirs to be operated in the most efficient manner using sound engineering and geological principles.
>
> Decisions, such as when to work over wells, when to drill new wells, maximum production rates are made jointly by all parties.
>
> If the Conservation Manager were to order unitization and not reveal the participating formula for some years later, and maybe even depletion of the reservoir, it would be difficult for operators to make these types of decisions or come to an agreement on these decisions because it may affect their final participation.

(Tr. 267). Moreover, Sun's Thornton admitted that the allocation formulas for all 22 units in Sun's exhibit 15 used a period prior to unitization to allocate primary production (Tr. 173).

Sun's suggestion that Shell's 45.1 share of production be changed to a figure (34) representing Shell's actual share of production at the time the

allocation formula was adopted has a surface sheen of legitimacy. As Shell points out, however, the Conservation Manager removes the parties' incentive for delay and recalcitrance when negotiating or formulating a unit agreement if, in those cases where negotiations fail, he uses only the information available to the parties during their negotiations. Moreover, Survey apparently did not regard the production between July 1, 1976, and March 23, 1977, to be representative. MMS's testimony indicates that Shell's well A-9 was off production during most of this period, and the Conservation Manager had no reason to believe it would not be placed back on production given Shell's March 15, 1977, request to workover this well.30/

If, as Sun desires, we were to reduce Shell's share of production, the weighting factor associated with production would necessarily rise. This is because Shell's weighting factor equals its reservoir share less its share of representative production. Sun does not seek to change the relationship of these three factors but states instead that it will adhere to the fundamental structure of the Conservation Manager's original formula and utilize the same procedure for determining weighting factors. 31/ A rise in the weighting factor assigned to production, however, increases the amount of reserves originally underlying Shell's lease which will be allocated to Sun. If, for example, the portion of production attributable to Shell is reduced from 45.1 to 34, Shell is effectively drained of 22 percent of reservoir reserves, an increase of 9 percent over Survey's formula. No basis exists for such

30/ MMS Direct Testimony, Durr and Tschoepe at 4.
31/ Sun Direct Testimony, Burns at 6.

adjustment, nor for the periodic adjustments to the production percentage that Sun seeks. 32/ Moreover, if Shell's production percentage is reduced to reflect its production (28.86 percent) through June 30, 1982, 33/ Shell would then be subject to drainage of 27 percent of reservoir reserves. For reasons illustrated above, this result does not offer a clearly superior alternative to Survey's formula. 34/

Implementation of the Conservation Manager's order to unitize has been stayed throughout the course of this litigation. See Sun Oil I, supra at 259, and Sun Oil II, supra at 85. As a result, the parties have at no time operated under the joint operating agreement that they prepared to carry out the objectives and purposes of the unit agreement. Production by both Sun and Shell has not, however, been stayed. Each has continued to produce and

32/ The periodic adjustments Sun mentions are contrary to its definition of "production during representative period" wherein it defines this term as "actual production during some specified time prior to unitization, such as 1-1-70 to 7-1-70, which the parties consider representative of the actual producing ability of the wells on each tract" (Sun Exh. 16).

33/ Though Sun now asks that the period of representative production be 6-1/2 years long, it earlier proposed to Survey that a 1-month period, May 1976, be chosen to determine the productivity factor. Sun's proposed formula would credit Shell with 65.5 percent of reserves and assign equal weights of 50 percent to reserves and production (Shell Exh. 7, Unit Agreement, Exh. C thereto).

34/ We note that Article IV of the unit agreement provides for revision of this production percentage if unit production should decrease on either or both of the unit tracts due to reasons other than natural reservoir depletion. In such instance, the operator or sub-operator may propose for the Supervisor's approval, or the Supervisor may direct, under the procedure provided in paragraph 17, OCS Order No. 11, that the participation schedule be revised. A revised participation schedule would employ the same tract reservoir volume percentages and weight factors, but different tract production percentages. Thus, where one party's actions adversely affect continued well production, the formula may be revised accordingly. If, as Shell believes, its decreased production was caused by natural reservoir depletion, Article IV would not authorize an adjustment of the production percentage.

Sun, because of a higher structural position and prolific wells, has, in fact, produced more than its 31.86 percent aliquot share of production.

Article XI of this joint operating agreement addressed the procedures to be followed to compensate Shell for the gas produced by Sun in excess of Sun's 31.86 percent share. This provision states in part:

> Both Tract 1 and Tract 2 have been producing before and since the November 14, 1975 effective date of the Unit Agreement, and their production since that date has not conformed to their unit participation nor been allocated to the tracts in accordance with the Unit Agreement. As a result, a net over-production relative to unit participation is owed in the way of compensation for drainage by the lessees of Tract 2 (Sun et al) to the lessee of Tract 1 (Shell).
>
> By way of compromise and settlement, this net over-production by Sun et al. will be settled by a cash payment to Shell for gas sold, gas processing plant liquids sold or taken in kind, and gas condensate recovered and sold in the field. Sun et al will make said payment to Shell not less than thirty days after the effective date of this Joint Operating Agreement provided each party has access to all production records within 10 days after such effective date. Said payment will equal the total sum realized by Sun et al (based upon the prices actually received by those producers comprising Sun, et al that are not small producers under FPC definition) from the sale of the aforesaid mentioned unitized products, after deducting therefrom the value of the 1/6 royalty paid and a production charge equal to three cents ($ .03) per thousand cubic feet as set out in Article X pertaining to such Tract 2 over-production. The quantum of unitized substances for which such payment shall be made shall be that proportionate amount of unitized substances allocated to Tract 1 under the terms of the unit agreement and actually produced from Tract 2. [Emphasis supplied.]

Shell estimates that as of January 1, 1983, Sun has retained approximately $ 24 million worth of gas and condensate allocable to Shell. Shell argues that the interest on this sum, itself, is approximately $ 12 million.

The remaining issue on appeal is whether Shell is entitled to interest on the value of gas produced by Sun in excess of Sun's 31.86 percent share from May 1977 forward. 35/ Judge Rampton held that Shell was so entitled and awarded simple interest at 7 percent. Sun and Shell have each appealed this ruling.

Sun's arguments are numerous but generally unpersuasive. It argues the joint operating agreement makes no provision for interest; the interest provision of accounting procedure 3(C) is inapplicable; the Board lacks statutory, regulatory, or inherent authority to award interest to a private party; Shell has waived its interest claim by failing to timely raise and appeal this issue; interest here would be inequitable; assuming interest is proper, Judge Rampton's application of Louisiana law, providing for 7 percent simple interest, should be upheld; and if prejudgment interest is awarded, equity demands that Sun be fully reimbursed for the cost of producing gas for Shell's benefit.

Shell seeks interest at 12 percent, relying upon paragraph 3(C) of the accounting procedures that form exhibit C to the joint operating agreement. Federal law, not surrogate state law, Shell contends, governs the computation of interest that Sun owes Shell.

[4] We hold Judge Rampton's application of Louisiana law calling for 7 percent simple interest to be proper. Use of state law is specifically

35/ The May 1977 date was chosen by Shell as it was the date that the provisions of Article XI of the joint operating agreement, liquidating its claims for prior production, would have become effective but for the appeal of Sun. See Shell Post-Hearing Brief at 78.

authorized by section 4 of the Outer Continental Shelf Lands Act, 43 U.S.C. § 1333(a)(2)(A) (1982). That section provides in part:

> (2)(A) To the extent that they are applicable and not inconsistent with this subchapter or with other Federal laws and regulations of the Secretary now in effect or hereafter adopted, the civil and criminal laws of each adjacent State, now in effect or hereafter adopted, amended, or repealed are declared to be the law of the United States for that portion of the subsoil and seabed of the outer Continental Shelf, * * * which would be within the area of the State if its boundaries were extended seaward to the outer margin of the outer Continental Shelf * * *.

Although this Board has not previously construed this statute in a similar context, the Board has held that Survey has the authority, independent of any specific statutory, regulatory, or contractual authority, to make a unilateral determination of interest owed where equity requires that it be imposed. Thus, in Peabody Coal Co., 72 IBLA 337, 348 (1983), we stated that interest payments were appropriate to compensate the Hopi and Navajo tribes for the loss of the use of coal royalties due but not paid, even when the lessee pursues a bona fide appeal of the underlying determination instead of paying the demanded amount. A similar holding was reached in Full Circle, Inc., 35 IBLA 325, 85 I.D. 207 (1978), a case involving the imposition of interest charges to a sum owed to the United States by the holder of a right-of-way who paid no right-of-way charges during a reappraisal period. And in Atlantic Richfield Co., 21 IBLA 98, 107, 82 I.D. 316, 320 (1975), we looked to the totality of the circumstances to determine whether equity warranted the imposition of prejudgment interest on royalty payments due the United States. The failure of the parties to provide for interest on amounts

attributable to Sun's overproduction is, therefore, not a bar to Shell's recovery in the instant case. 36/

Nor is Shell's failure to file a notice of appeal from the Director's June 5, 1981, decision a bar to its recovery. Although this decision followed Shell's initial request for interest on April 20, 1979, the Director's decision is entirely silent as to this issue. The issue of interest was considered for the first time by Judge Rampton. Although a remand to MMS is one option presently available to the Board, the considerable length of time already consumed by this litigation and the likelihood of a further appeal to this Board on the interest issue compel us to decide this issue now.

Judge Rampton held that Louisiana law must be applied in determining what interest rate to fix because he found no controlling contractual provision in the joint operating agreement. We agree with Judge Rampton that the 12 percent interest rate called for in paragraph 3(C) of the accounting procedures (Exh. C to the joint operating agreement) is not expressly applicable. That rate applies to unpaid amounts that the operator may require a non-operator to advance for the succeeding month's operation.

Our examination of the relevant materials has disclosed no statute or Departmental regulation that would fix the interest rate in dispute, nor

36/ See also Amoco Production Co., 78 IBLA 93 (1983); Donald R. Clark, 39 IBLA 182 (1979).

have the parties demonstrated otherwise. It was proper, therefore, for Judge Rampton to look to state law. Louisiana statute LSA-C.C. Art. 1940 (West 1977) provides that where no conventional interest rate is stipulated in a contract, the legal rate of interest in effect at the time the contract was made shall be recovered. A subsequent change in the legal rate does not change the rate recoverable. Id. Recourse to this statute could properly be made in determining the amount of interest owed to Shell.

Judge Rampton found the legal rate of interest under Louisiana law at the time the field was unitized to be 7 percent. LSA-C.C. Art. 1938 (West 1977). Simple interest is the rule in Louisiana, Judge Rampton determined, applicable to all corporations regardless of custom or the character of business involved. LSA-C.C. Art. 1939 (West 1977). In the absence of a statutory exception, interest can be compounded only by adding it to the principal and creating a new debt with a new contract. Id.

Our holdings in Peabody Coal Co., Atlantic Richfield Co., and Full Circle, Inc., supra, provide clear authority for an award of prejudgment interest. To deny interest to Shell for the more than 8-year period during which Sun has had the use of funds belonging to Shell (in excess of $ 24 million) would unjustly enrich Sun at Shell's expense. Such windfall could also create an incentive in the future for parties to unduly prolong litigation. We reiterate our conclusion in Peabody Coal Co. that, given the high rate of inflation during the period in question, equity requires

compensation for the time value of money. Judge Rampton's award of 7 percent simple interest is, accordingly, affirmed. 37/

Sun argues that if this Board awards prejudgment interest, Sun should be fully reimbursed for the cost of producing gas for Shell's benefit. By the terms of Article X of the joint operating agreement, Shell is to pay $ 0.03 per Mcf for gas produced by Sun in excess of its share. This sum was fixed by the parties "in lieu of payment for the actual operating and maintenance cost of producing unitized substances" in excess of Sun's share. Sun states that its production costs in 1982 exceeded twenty-seven cents ($ 0.27) per Mcf, though Shell replies this is double its own production costs during the same period.

Judge Rampton denied relief on two bases: First, he noted that he was not asked to decide this issue by the Board; second, he held that jurisdiction over this dispute involving, as it does, the terms of a private contract, lies with the Louisiana state courts.

37/ Effective Jan. 1, 1985, Articles 1938, 1939, and 1940 of the Louisiana Civil Code were amended by Articles 2000 and 2001. Article 2000 provides: "When the object of the performance is a sum of money, damages for delay in performance are measured by the interest on that sum from the time it is due, at the rate agreed by the parties or, in the absence of agreement, at the legal rate in effect at the time it is due. The obligee may recover these damages without having to prove any loss." Article 2001 addresses interest on interest and is not applicable. Thus, for payments coming due after Jan. 1, 1985, interest at the then current legal rate, as provided by Louisiana law, must be paid. For purposes of determining when payments for overproduction come due, the stay granted by the Director, and in effect ever since, shall not affect this calculation.

Sun's Manager of Strategic Projects, Ernest D. Watson, testified that Sun never agreed that the $ 0.03 figure would apply to future gas volumes. That figure would, however, have been appropriate for gas production during November 14, 1975, and March 23, 1977 (Sun Reply Testimony, Watson at 2-3). When asked by Judge Rampton how such a cost figure could find its way into the joint operating agreement, Watson testified:

> THE WITNESS: We fully recognized that operating costs go up substantially over time as the production goes down.
>
> Now, how it could have gotten into the operating agreement and why we didn't object to it, quite frankly, the formula gave us more concern than did the operating costs.
>
> The formula was ten or twenty or thirtyfold what was at issue in a three cent operating cost that we felt we could do something about later on or with the operating agreement. In a suspended state, let's say.

(Tr. 210). Sun signed the joint agreement in May 1977 under protest, but does not appear to have objected to this term (Shell Direct Testimony, Amadon at 23). Indeed, Sun concedes its objection has not been preserved on appeal (and includes Shell's request for interest in this same category).38/ Sun's request that this term be revised to provide for reimbursement of actual operating costs 39/ is tantamount to a request for reformation of this article. Appellants Clark and Diamond Shamrock argue that if the Board has the authority to rewrite the joint operating agreement to provide interest for Shell in

38/ Brief of Sun Exploration and Production Company at 3 and Reply Memorandum of Petro-Lewis Corporation at 17-18. This latter memorandum of Petro-Lewis is the subject of a motion to strike by Shell and a request by Shell to further plead. Both the motion and request are denied.
39/ Sun Direct Testimony, Burns at 9.

the name of equity, the Board has a corresponding equitable duty to reform the joint operating agreement to allow an offset for the Sun group's actual production costs. 40/

Clark and Diamond Shamrock mischaracterize the Board's action in granting Shell's request for interest as a "rewrite" of the joint operating agreement. This is simply inaccurate. The Board's decision to grant interest is premised not on any view that it has the authority to unilaterally modify agreements between the parties, but rather proceeds from its recognition that it may, in the interest of equity, require interest payments on funds withheld in order to make the prevailing party whole. In the instant case, Sun sought and obtained a stay of the effect of the original order directing that operations under the unit plan commence, alleging that it would show error in the Survey allocation formula. It can now be seen that Sun has failed to establish such error. It remains, therefore, for Sun to tender such payments as would make Shell whole. Indeed, by seeking a stay of the effect of the Conservation Manager's order, Sun has implicitly obligated itself to pay such amounts as might be deemed necessary to restore the status quo ante should its arguments prove substantively unavailing. These are the considerations which lead to the assessment of interest in this case and they are independent of and without any necessary reference to the terms of the joint operating agreement.

40/ Statement of reasons in support of the appeal of Clark and Diamond at 54. This pleading also contains a request for oral argument. In light of the quality and quantity of pleadings in the record, this request is denied.

This must be contrasted with the alteration which Sun now seeks in the joint operating agreement. The provision which is codified in Article X was not included at the behest of Survey. Rather, it resulted from the negotiations of the parties. It may be that the provision was included by inadvertence. Be that as it may, it would seem to us that the power to revise this provision cannot be said to be incidental to the Department's authority to compel unitization. This Board has no authority to reform the unit agreement by amending Article X.

We hold, therefore, that: (1) Survey's division of the reservoir based upon a 79.6/20.4 apportionment is correct; (2) in ordering mandatory unitization production should be allocated on the basis of net-acre feet save in unusual circumstances, (3) Sun has failed to establish that its proposed allocation formulas were clearly superior to Survey's; (4) Shell is entitled to 7 percent simple interest on the amounts owed it by Sun; and (5) the Board has no authority to revise Article X of the unit agreement.

Accordingly, pursuant to the authority delegated to the Board of Land Appeals by the Secretary of the Interior, 43 CFR 4.1, the decision of Administrative Law Judge Rampton is affirmed as modified.

James L. Burski
Administrative Judge

We concur:

Bruce R. Harris
Administrative Judge

R. W. Mullen
Administrative Judge